

CLAIMS

1. A system for controlling execution timing of jobs, comprising:

2 job execution means for executing a plurality of jobs, wherein said plurality of
3 jobs includes a first job executed at irregular time intervals and a second job executed at
4 regular time intervals;

5 probability distribution forming means for determining a probability distribution
6 for times at which execution of said first job occurs; and

execution timing means for scheduling execution of said second job in
accordance with said probability distribution.

2. The system according to Claim 1, wherein the starting point of the probability
distribution is set at the time at which said first job has completed execution.

3. The system according to Claim 1, wherein said probability distribution forming
means includes means for determining the probability distribution with respect to time
3 zones, week-day zones and/or seasonal zones, and

4 wherein said execution timing means schedules execution of said second job on
5 the basis of the probability distribution according to the current time, the current day in
6 a week and/or the current season.

1 4. The system according to Claim 1, wherein said probability distribution forming
2 means includes means for determining the probability distribution in accordance with a
3 predetermined number of latest data items in a predetermined last period in the data
4 about the times at which execution of said first job has occurred.

1 5. The system according to Claim 2, wherein said probability distribution forming
2 means includes:

3 time lapse measuring means for measuring a lapse of time from the time at which
4 the first job execution is finished;

 array means having array elements corresponding to a plurality of intervals
 defined by dividing the lapse of time from the time at which said first job execution is
 finished;

 updating means for:

 monitoring occurrences of execution of the first job; and

10 updating the value of the array element related to the interval
11 corresponding to the lapse of time after an occurrence of execution of said first
12 job; and

13 probability distribution computation means for computing the probability of
14 occurrence of execution of said first job in each interval on the basis of the value of the
15 corresponding array element.

1 6. The system according to Claim 5, wherein the length of each of the intervals is
2 set longer than the time period required for processing said second job.

3 7. The system according to Claim 1, further comprising:

4 comparison means for comparing a reference value, Tmax, with a non-occurrence
5 duration, t, defined as a time period between execution processing of said first job; and

6 execution inhibition means for inhibiting said job execution means from
7 executing the second job until a condition: $t > Tmax$ is satisfied once after execution of
8 said second job.

9 8. The system according to Claim 7, further comprising:

10 interval division means for dividing the lapse of time from the time at which said
11 first job is finished into a plurality of intervals, wherein the lapse of time from the time
12 at which said first job is finished is set as the time start point of said probability
13 distribution;

6 expectation computation means, responsive to no execution of said first job from
7 said time start point to the end of a first interval among said plurality of intervals, for
8 utilizing said probability distribution to compute an expectation T1 as a predicted time
9 period prior to a time at which said second job can be executed after completed execution
10 of said first job from the end point of one of said plurality of intervals;

11 minimum probability interval detection means for detecting one of said plurality
12 of intervals that corresponds to the minimum probability among said plurality of intervals
13 between said time start point and Tm, wherein Tm is the end point of one of the intervals

14 in which T_1 at the end point of each interval satisfies a condition: $T_1 < T_{max}$ with respect
15 to the predetermined reference value T_{max} , and which is the furthest from the time start
16 point; and

17 execution timing means for scheduling the execution of second job in the interval
18 detected by said minimum probability interval detection means.

1 9. The system according to Claim 8, further comprising reference value setting
2 means for controllably setting T_{max} .

a pair of complementary data inputs;

a pair of data path pass-transistor logic (PTL) transistors configured as pass-gates with respect to each of said pair of complementary data inputs and having the PTL transistor gate terminals connected to a control node, wherein said pair of data path PTL transistors pass data from said pair of complementary data inputs into a pair of complementary storage nodes in response to a latch trigger pulse applied to said control node; and

10 a pulse generator that passes said latch trigger pulse to said control node in
11 response to a clock signal transition.

1 10. A method for controlling execution timing of jobs, comprising:

2 executing a plurality of jobs, wherein said plurality of jobs includes a first job
3 executed at irregular time intervals and a second job executed at regular time intervals;

4 determining a probability distribution for times at which execution of said first

5 job occurs; and

6 scheduling execution of said second job in accordance with said probability
7 distribution.

1 11. The method according to Claim 10, further comprising setting the starting point
2 of the probability distribution to the time at which said first job has completed execution.

1 12. The method according to Claim 10, further comprising:

determining the probability distribution with respect to time zones, week-day
zones and/or seasonal zones, and

scheduling execution of said second job on the basis of the probability
distribution according to the current time, the current day in a week and/or the current
season.

1 13. The method according to Claim 10, further comprising determining the
2 probability distribution in accordance with a predetermined number of latest data items
3 in a predetermined last period in the data about the times at which execution of said first
4 job has occurred.

1 14. The method according to Claim 11, further comprising:

2 measuring a lapse of time from the time at which the first job execution is
3 finished;

4 generating array elements corresponding to a plurality of intervals defined by

5 dividing the lapse of time from the time at which said first job execution is finished;

6 monitoring occurrences of execution of the first job;

7 updating the value of the array element related to the interval corresponding to
8 the lapse of time after an occurrence of execution of said first job; and

9 computing the probability of occurrence of execution of said first job in each
10 interval on the basis of the value of the corresponding array element.

15. The method according to Claim 14, further comprising setting the length of each
of the intervals longer than the time period required for processing said second job.

16. The method according to Claim 10, further comprising:

4 comparing a reference value, T_{max} , with a non-occurrence duration, t , defined
as a time period between execution processing of said first job; and

5 inhibiting said job execution means from executing the second job until a
condition: $t > T_{max}$ is satisfied once after execution of said second job.

17. The method according to Claim 16, further comprising:

2 dividing the lapse of time from the time at which said first job is finished into a
3 plurality of intervals, wherein the lapse of time from the time at which said first job is
4 finished is set as the time start point of said probability distribution;

5 responsive to no execution of said first job from said time start point to the end

6 of a first interval among said plurality of intervals, utilizing said probability distribution
7 to compute an expectation T1 as a predicted time period prior to a time at which said
8 second job can be executed after completed execution of said first job from the end point
9 of one of said plurality of intervals;

10 detecting one of said plurality of intervals that corresponds to the minimum
11 probability among said plurality of intervals between said time start point and Tm,
12 wherein Tm is the end point of one of the intervals in which T1 at the end point of each
13 interval satisfies a condition: T1 < Tmax with respect to the predetermined reference
14 value Tmax, and which is the furthest from the time start point; and

15 scheduling the execution of second job in the interval detected by said minimum
16 probability interval detection means.

18. The method according to Claim 17, further comprising controllably setting Tmax.

19. A program product for controlling execution timing of jobs, comprising:

2 program instructions for executing a plurality of jobs, wherein said plurality of
3 jobs includes a first job executed at irregular time intervals and a second job executed at
4 regular time intervals;

5 program instructions for determining a probability distribution for times at which
6 execution of said first job occurs; and

7 program instructions for scheduling execution of said second job in accordance
8 with said probability distribution.

1 20. The program product according to Claim 19, further comprising program
2 instructions for setting the starting point of the probability distribution to the time at
3 which said first job has completed execution.

1 21. The program product according to Claim 19, further comprising:

2 3 program instructions for determining the probability distribution with respect to
time zones, week-day zones and/or seasonal zones, and

4 5 6 program instructions for scheduling execution of said second job on the basis of
the probability distribution according to the current time, the current day in a week and/or
the current season.

2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1041 1042 1043 1044 1045 1046 1047 1048 1049 1040 1041 1042 1043 1044 1045 1046 1047 1048 1049 1050 1051 1052 1053 1054 1055 1056 1057 1058 1059 1050 1051 1052 1053 1054 1055 1056 1057 1058 1059 1060 1061 1062 1063 1064 1065 1066 1067 1068 1069 1060 1061 1062 1063 1064 1065 1066 1067 1068

program instructions for updating the value of the array element related to the interval corresponding to the lapse of time after an occurrence of execution of said first job; and

program instructions for computing the probability of occurrence of execution of said first job in each interval on the basis of the value of the corresponding array element.

24. The program product according to Claim 23, further comprising program instructions for setting the length of each of the intervals longer than the time period required for processing said second job.

25. The program product according to Claim 19, further comprising:

program instructions for comparing a reference value, T_{max} , with a non-occurrence duration, t , defined as a time period between execution processing of said first job; and

program instructions for inhibiting said job execution means from executing the second job until a condition: $t > T_{max}$ is satisfied once after execution of said second job.

26. The program product according to Claim 25, further comprising:

program instructions for dividing the lapse of time from the time at which said first job is finished into a plurality of intervals, wherein the lapse of time from the time at which said first job is finished is set as the time start point of said probability distribution;

6 program instructions, responsive to no execution of said first job from said time
7 start point to the end of a first interval among said plurality of intervals, for utilizing said
8 probability distribution to compute an expectation T_1 as a predicted time period prior
9 to a time at which said second job can be executed after completed execution of said first
10 job from the end point of one of said plurality of intervals;

11 program instructions for detecting one of said plurality of intervals that
12 corresponds to the minimum probability among said plurality of intervals between said
13 time start point and T_m , wherein T_m is the end point of one of the intervals in which T_1
14 at the end point of each interval satisfies a condition: $T_1 < T_{max}$ with respect to the
15 predetermined reference value T_{max} , and which is the furthest from the time start point;
16 and

17 program instructions for scheduling the execution of second job in the interval
18 detected by said minimum probability interval detection means.

27. The program product according to Claim 26, further comprising program
instructions for controllably setting T_{max} .